1. Europe's Energy Dilemma: Its Impact on Developments in the 1980s

Europe's division after World War II into two very different economic and political entities greatly influenced its energy policies. The rapid economic growth and especially the requirements of industrial technology during the last thirty-five years placed great demands on available fuel resources and hence both Western and Eastern Europe became increasingly dependent upon imports. Energy developments, especially the two huge price increases in 1973–74 and 1978–79 and the Arab oil embargo of 1973–74, presented not only unusual problems and challenges, but also a serious dilemma for all European countries.[1]

Every European country was affected by the energy supply situation during the 1970s as a result of the uncertainties created by the developments in the Middle East, the Arab oil embargo, production restrictions, huge oil price increases, and insufficient attention to their indigenous resources. The problem was a more serious one for the Western European countries than for the Eastern European countries because for the latter dependable supplies of oil, coal, and natural gas were available from the Soviet Union. For the Eastern European countries it is essential to modernize their industries and accelerate economic growth, which requires a shift to hydrocarbons. But because of shortages of oil and natural gas, with the exception of Romania until the latter part of the 1970s, the bulk of their needs had to be imported, mostly from the Soviet Union.

The industrialized countries of Western Europe, especially, were faced with the question of crude oil availability, which left both a short-term and a long-term impact on every aspect of their social, economic, and political fabric. Most of Western Europe's oil now has to be imported from an unstable Middle East and North Africa and an increasing amount comes from the Soviet Union. With increasing demand for natural gas, in part brought about by a decline in oil imports, growing imports from the Soviet Union and Algeria contribute to a new supply insecurity. In spite of conservation and increased use of indigenous resources by the late 1970s, especially the oil and natural gas from the North Sea, its potential reserves are insufficient for long-term relief and the costs of exploration and exploitation are constantly increasing. Even greatly increased Western cooperation in numerous areas, while essential in reducing their vulnerability to oil and gas disruptions, cannot completely ease the security problems that result from heavy energy imports.

The Changing Energy Pattern

Europe's principal energy resource was coal (bituminous and lignite) from the time of industrialization, in the second half of the 18th century, until the second

part of the 1950s in Western Europe; it is still the primary energy source for the Eastern European countries. Mining of Europe's sizable coal resources was achieved by exploiting coal seams of constantly increasing depth, and centers of industry continued to develop around these coal-mining sites until the early 1960s. Indigenous coal provided a wide range of uses for Europe's population, in addition to its traditional application in manufacturing. It was used for heating homes on the continent, providing power for railways, generating electricity almost exclusively, and was the major raw material for the new chemical industries of Western Europe. Coal was the main source of energy supply for Western Europe until the 1960s—covering roughly 86 percent of total energy consumption in 1950, 59 percent in 1960, but only 23 percent in 1982. At these respective dates it accounted for 96 percent, 84 percent, and 58 percent of total supplies in Eastern Europe (see appendix A and table 1.1). Most of the consumption was covered by indigenous production (see appendix B).

Western Europe

As a result of World War II the rebuilding of a war-damaged and somewhat antiquated coal industry and the planned expansion of coal production from indigenous supplies received top priority in every Western European country having coal resources. Imports of coal together with fiscal and other incentives designed to enhance the flow of crude oil and oil products to Western Europe "were seen essentially as short-term expedients by the policy makers,"[2] while the coal industry was modernized through a large-scale program of investments. What the coal industry was not prepared for was the increasing demand from a rapidly growing energy-intensive Western European economy beginning in the late 1950s. The indigenous coal-producing industries were unable to meet this growing demand. On the other hand, the oil industry was willing and able to supply limitless quantities of low-priced oil, mostly from the sizable Middle Eastern and North African fields. The difficulties of the coal industry were exacerbated by a series of wage concessions which eventually amounted to over 50 percent of the total costs. Competing for markets at acceptable profit levels, especially after the late 1950s when the market was saturated by ever-growing supplies of oil, became extremely difficult for the Western European coal industries.

Most Western European governments were forced to support their coal industry so that by 1950 Britain and France had nationalized coal production. Other steps taken included subsidies to mining regions, tax benefits for industrial diversification in certain coal-producing regions such as the Ruhr and the Saar, retraining miners, and restrictions on the use of oil in power generation. The European Economic Community (EEC) assisted its members financially in closing uneconomical mines, and contributed to the costs of resettlement and retraining workers. Since the 1960s the number of coal miners has declined dramatically, from 1.6 million to 650,000 in 1970. By 1982, 564,000 remained employed in the coal fields of Western Europe.[3] In West Germany alone the number of coal miners declined from 295,000 in 1966 to 188,000 in 1982. The

Table 1.1. Summary of European energy developments

	OECD			EC			CMEA		
	1974	1981	1982	1974	1981	1982	1974	1981	1982
Oil (in percent)	57.0	51.0	48.9	57.2	48.1	48.7	23.0	20.0	21.3
Gas (in percent)	12.0	15.1	15.0	14.3	17.6	17.8	13.8	15.3	17.4
Coal (in percent)	22.5	20.6	23.0	23.5	24.8	24.3	60.6	58.4	57.7
Nuclear (in percent)	1.7	8.0	6.0	1.8	4.3	7.4	0.1	1.4	1.0
Hydro/geothermal	6.8	5.3	7.1	3.2	5.2	1.8	2.5	1.3	2.5
Oil									
production (mtoe)	16.5	129.3	144.4	10.5	103.0	117.0	18.1	16.0	14.3
consumption (mtoe)	713.7	587.1	543.9	586.8	464.0	429.4	72.7	83.0	88.5
net import reliance (in percent)	97.7	78.0	73.5	98.2	77.8	72.7	76.7	81.7	83.9
Natural gas									
production (mtoe)	153.2	155.0	154.3	130.2	130.7	136.0	39.8	50.3	48.5
consumption (mtoe)	164.6	178.4	171.7	136.3	169.7	163.1	46.7	75.2	72.3
net import reliance (in percent)	6.9	13.1	10.2	4.2	20.2	23.0	14.8	32.4	32.9
Coal									
production (mtoe)	201.7	219.9	213.6	185.2	191.7	183.8	225.2	233.8	242.7
consumption (mtoe)	237.3	282.6	255.1	208.8	238.9	211.4	211.5	240.3	239.7
net import reliance (in percent)	15.0	22.2	16.3	11.3	19.8	13.1	net exp.	2.7	net exp.
Primary energy									
production (mtoe)	465.8	667.5	645.4	370.9	515.8	490.8	282.8	302.9	316.9
consumption (mtoe)	1217.6	1211.6	1110.7	977.3	965.0	872.8	364.6	402.5	415.5
net import reliance (in percent)	61.8	45.0	41.8	62.1	46.5	43.7	16.5	24.8	23.7

Sources: various tables from United Nations; OECD, *Energy Balances of OECD Countries, 1971-1981* (Paris, 1983); Eurostat, *Revue 1972-1981; Basic Statistics*, 1983 edition; Wharton Econometric Forecasting Associates, *Centrally Planned Economies Current Analysis*, vol. 3, nos. 40-42 (June 1983).

assistance by the EEC was of special importance to France, Belgium, and the Netherlands, with their nearly exhausted mines.

The coal industry faced other problems, such as the rigid control by the European Coal and Steel Community (ECSC), "fearful of the return to the monopolistic practices of the pre-war period," while on the other hand no such rules "existed for limiting the entry of the multinational oil companies into the European market."[4]

The change in the structure of the energy supply in Western Europe was much influenced by preferences, by obvious environmental advantages, by the ease of transport once a pipeline grid, which facilitated the spatial spread of industrial locations, was established, by decreasing productivity in coal mines with the exhaustion of easily worked seams, and by the obvious advantage of the artificially low-priced fuel oils. This basic structural change contributed to serious social and regional problems that necessitated adaptation, a process which will continue for some time in view of the continuous structural changes since the oil crisis of 1973–74.

The fundamental shift in Western Europe's energy structure since the late 1950s, emerging from constantly increased imports of crude oil from the Middle East and Africa, resulted in a greatly increased energy dependency and a drastic decline in Western Europe's coal production (331 mtoe in 1960 to 201 mtoe in 1974 and a slow increase to 220 mtoe in 1981—see appendix C). In spite of this decline, the import share in consumption increased between 1973 and 1980 from 10.8 to 22.6 percent. Production of bituminous coal in West Germany, Western Europe's largest coal supplier, decreased from a high in 1960 of 118 mtoe to 84 mtoe in 1978 and slowly increased to 93 mtoe by 1981. As a result of the economic slowdown it decreased again to 89 mtoe in 1982 (see figure 1.1).

The discovery of natural gas in the Netherlands in the late 1950s and of crude oil in the North Sea during the 1960s resulted in the building of a large gas-gathering system (see the discussions in chapter 2) with sufficient capacity for both. Pipelines had over 500 million tons' capacity by the mid-1970s. They have greatly affected the pattern of energy supply in Western Europe since the 1960s. As a result of greatly increased energy demands between the 1950s and early 1970s—about 5.5 percent yearly for all of Europe and 5.7 percent for the members of the European Community—a rapidly changing industrial structure and greatly increased international trade in energy sources developed.

What were the specific reasons for this sudden change in Europe's—and specifically Western Europe's—energy picture? R. Prodi and A. Clô, in their penetrating study of the background to the 1974–75 oil crisis in Europe, conclude that

> from the early nineteen-fifties, the policies of European governments toward the energy market were based, at least in part, on the conviction that the cost of energy represented an important variable in the costs of industrial production. Low-cost energy was considered decisive in determining the position European industry would have in the international market. As a result the

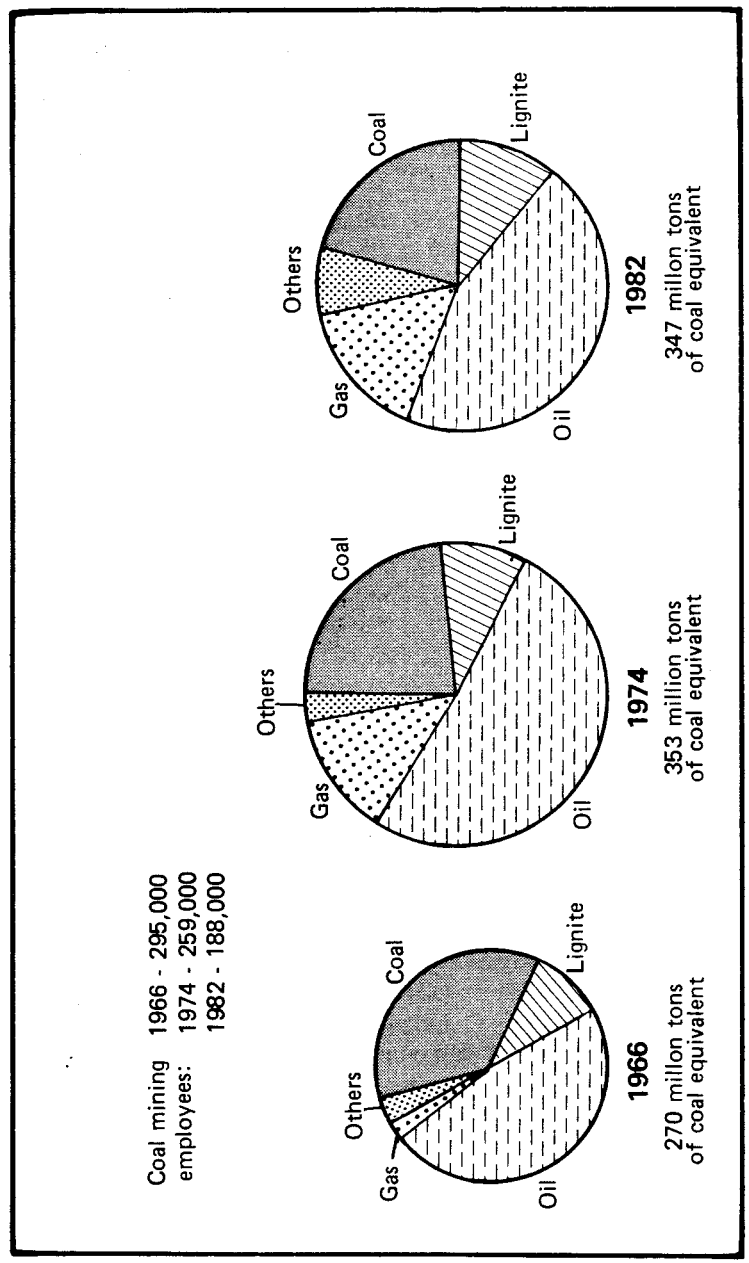

Figure 1.1. West Germany: coal—the loser (percentage of energy consumption)
Sources: Graph from George W. Hoffman, ed., *A Geography of Europe: Problems and Prospects*, 5th ed. (New York: John Wiley, 1983), 382, fig. 8–15. Basic data from Eurostat, *Basic Statistics of the Community* (Luxembourg: Office of Official Publications of the EC, 1980).

price of coal was held down to the point where it would amount to no more than 5 percent of total industrial costs. Control over the price of coal, however, prevented the coal industry from accumulating reserves sufficient to deal with periods of crisis. When the demand for energy suddenly increased in 1956–57, foreign coal had to be imported at prices 40 to 50 percent higher than those in Europe. The decline in the price of oil in the late fifties dealt the final blow to the European coal industry.[5]

Coal's position on Western European markets was negatively influenced during the 1960s by changes in Western European energy policy which reflected the availability of more competitive energy imports. Coal was unable to hold even its declining market share during the 1960s and thus crude oil captured the increased demand. This increased demand greatly benefited the economies of the Western countries in view of the prevailing competition on the energy market with its low oil prices and the easily available supplies. Coal was unable to compete with oil in spite of various government incentives.

Changes in the energy supply pattern of Western Europe were influenced by the rising standard of living, but also by the decision of President Eisenhower in 1958 to restrict crude oil imports into the United States. This increased the quantity of Middle East supplies in the markets of Western Europe and Japan. A recent study by the European Community concludes that "the shift towards oil had major repercussions on the strategic and geopolitical situation on a worldwide scale."[6] This shift added to the political and economic power of the oil exporting countries.

The major factor explaining the use of coal and, later, of natural gas related to the price differences on a calorific basis between oil, coal, and gas on the one hand and the costs of nuclear power, on the other, for the production of electricity. A recent report by the United Nations explains these price differences between 1973 and 1980. "Whereas, for example, in 1970 imported oil was cheaper than imported gas and coal in Western Europe by 13 and 80 percent, in 1980 oil was more expensive by 35 and 147 percent respectively."[7] An IEA report indicates that coal was 30 to 50 percent cheaper.[8] Before the first oil price increase in 1973–74, imported coal was generally more expensive than imported oil. After the price increase the cost of imported coal was close to that of imported oil, but after the second price increase in 1978–80 imported coal became competitive with imported oil and also made inroads where nuclear power previously held an advantage.[9] Increased imports are also heavily dependent upon the overall economic situation and the success of energy savings. Instead, a slow but steady growth in the use of coal is now forecast, but forecasts vary greatly, as will be discussed later in this chapter.

After the 1973–74 oil crisis, Western European governments became more aware of the importance and potential of the gas industry. With gas prices only slowly following oil prices during the 1970s, gas demands rapidly increased, with the share of primary energy consumption met by gas reaching 18 percent in 1982

for the European Community and 15 percent in 1981 for Western Europe as a whole. The picture regarding natural gas had radically changed during the 1970s from self-sufficiency for Western Europe at the beginning of the decade (a small surplus was even available for export) to imports by 1981 of 13 percent for Western Europe's consumption and 23 percent for the European Community. Yet this is quite different from Western Europe's and the European Community's import reliance of 73.5 percent (1982) of their oil imports. Demand for natural gas by the members of the Community was met by 82 percent (1982), and 85 percent for all of Western Europe (1982) from indigenous sources, with the Netherlands exporting around 54 percent of its gas production to the Community, accounting for approximately 37 percent of Western Europe's gas supply (see table 2.12 and appendix D).

The countries of Western Europe eventually paid dearly for being unprepared and having no contingency plans, e.g., the lack of development of oil substitutes, little attention given to their indigenous resources, and no provision for emergency coal and oil storage. While the Commission of the European Community (EC) as early as 1962 was concerned with the energy development, no energy policy for the Community was effectively introduced. As a result of the lack of joint policies for the six and later nine members of the Community (Greece joined the Community only in 1981), national and often parochial interests prevailed and contributed to the energy shocks of the 1970s.

Eastern Europe

Most of the countries of Eastern Europe were economically backward before World War II.[10] The newly created heterogeneous national states, with some exceptions in Czechoslovakia and Yugoslavia, lacked a satisfactory basis for the development of their industries, even though individual plants existed in Poland, East Germany, and to a lesser extent in Hungary and Romania. Many of these plants in the post–World War II period became the foundation for a more concentrated industrialization. A large percentage of the population depended upon agriculture for their income, and agriculture was characterized by a large labor surplus and low per capita productivity. Industrial development in the interwar years was based largely on unsound principles: local raw materials that could have laid the foundation for a prospering industry were sold abroad, and finished products were purchased at a high price. Foreign capital for new investments was scarce, and available funds usually found their way into extractive industries only. In retrospect it is therefore surprising how much progress was made in the social and economic spheres during this time, since the region actually had only about ten years of peaceful independent development, from 1919 to the onset of the world depression. Whereas the height of the depression was reached by 1935, its repercussions were felt until the beginning of World War II.

The end of World War II and the establishment of Soviet hegemony brought about basic changes in the political geography of the region as well as a complete

restructuring of the economic and social life of these countries. Early on, Moscow imposed Stalinist central planning in Eastern Europe, with only slight variations among the individual countries. It also discouraged economic and political cooperation with Western industrialized states. Because the war had affected these countries differently in terms of war damages and later in reparations and unrequited transfers to the Soviet Union, changes demanded by the introduction of the Soviet model of development had an important impact in every country. By imposing central control and institutional synchronization, the Soviet Union attempted to implement in Eastern Europe a rapid industrialization modeled after its own development. The industries given priority, notably those in iron and steel production, light metals, chemicals, and engineering, were all energy-intensive.

The Soviet-enforced industrialization programs emphasized high rates of investment, abundant labor, and cheap raw materials, the latter to be imported largely from the Soviet Union because of the resource poverty of Eastern European countries. Coal (bituminous coal in Poland and smaller amounts in Czechoslovakia) and lignite in every country were the main energy resources, with solid fuels contributing 96.4 percent to the primary energy balance of the six European CMEA countries in 1950. Until the early 1960s the energy supply problem resulted in rationing of fuel and power in most Eastern European countries. Only when abundant Soviet fuels became available did the supply situation improve, at least temporarily, though power shortages continued during periods of drought and are experienced even at the present time. Thus, efforts to create socialist autarky, especially during this accelerated drive for industrialization, overcommitted Eastern Europe's available fuels. In addition, little attention was given to the modernization of coal production besides the rebuilding of war-scarred production facilities. The decision to rely on an ever-increasing amount of imported energy resources for industrialization was to have major consequences in the 1970s.

Until the mid-1970s, little investment went into modernizing raw material production. This was a rational policy if one considers the low quality and quantities of most of the region's raw materials. The region's limited supply of minerals, therefore, was quickly exhausted, and the wasteful use of many of the minerals required greatly increased net imports of raw materials and energy since the 1960s. During this period the Soviet Union substantially increased its exports of natural resources to Eastern Europe, which in turn paid for the imports with manufactured goods. In the 1950s Soviet and Eastern European trade in fuel and raw materials was nearly balanced, but by the mid-1960s the Eastern European countries imported four times as much as they exported to the Soviet Union.

Average per capita energy consumption in the Eastern European countries increased substantially after 1960. This was largely due to the industrial structures of these countries, their energy utilization processes, the artificially depressed fuel prices, and an energy mix based on "poor quality solid fuels, resulting in low rates of heat capture, relatively high energy input to the energy industries themselves, and, incidentally, staggering environmental damage."[11] The high per capita energy consumption of the three northern countries—Poland, Czechoslovakia, and East Germany—was the result of their large metallurgical and chemical industries. In 1960, the proportion of solid fuels ranged above 90 percent of the energy balance in Poland and East Germany and was between 70 and 90 percent in the other countries of Eastern Europe—with the exception of Romania, with the sizable oil production mentioned earlier (see appendix A).

By the late 1950s modernization of the energy sector had become imperative, especially in those countries where highly polluting brown coal or lignite was used predominantly for generating power or for domestic heating, such as in East Germany, Czechoslovakia, and Bulgaria. The "wastage of heat from the burning of coal, lignite and other solids is much greater than from the combustion of oil products and gas, while in the chemical industry, petroleum can substitute for lignite 15 times its weight and 4.5 times its calorific content."[12] Brown coal and lignite were also used in some of these countries for chemical raw materials on a fairly large scale. Since the early 1970s various forces have exerted pressure to drastically change the energy mix, substituting hydrocarbons for coal, especially brown coal and lignite. Eastern Europe's own reserves of oil, gas, and most primary products were completely inadequate for its growing needs, with the exception of low-quality brown coal and lignite.[13] With the absence of free market competition, the coal production of the six CMEA countries has never reached even the low levels of the western European coal industries or had to fight to maintain market shares (see appendix C).

During the 1970s the Eastern European countries were also unable to increase production efficiencies, including a reduction of energy consumption per unit of GNP or the growth of per capita energy consumption[14] (see chapter 3). It was obvious that they had little choice except in gradually restructuring their fuel mix. The success of restructuring was apparent in the rapid increase in net oil and oil product imports from the Soviet Union during the 1970s in spite of the Soviet Union's expressed reluctance to supply these increases. Imports of crude oil and refined products from the Soviet Union were 11.5 million metric tons in 1960, which was 34.6 percent of the total exports of the Soviet Union. These imports rose to an average of 50 million metric tons in 1973, or 52 percent of Soviet exports, and about 81 million metric tons in 1980, which amounted to about 45 percent of total Soviet exports.[15] Table 1.2 provides crude oil import data. Similar differentials are cited for key primary products. Thus, eight primary products (weighted average) accounted for about 60 percent of the value of all Soviet exports to CMEA and 29 percent to the West in 1970. By 1976 they accounted for 44 percent to CMEA, and had increased to 35 percent to the West. Net exports of natural gas by 1976 accounted for 4 percent of the value of exports to the West and 3.3 percent of exports to CMEA.[16]

The centrally planned economies between 1976 and 1980 could claim an average annual growth of primary energy production of 3.4 percent, with considerable differences among individual countries. This compares with an annual

Table 1.2. Eastern European crude oil imports, 1973–82

Country	Year	Total imports (mmt)	Oil imports as percentage of total energy consumption	Oil imports from the U.S.S.R.	
				percentage	mmt
Bulgaria	1982	12.82	31.0	86.7	11.11
	1981	13.31	41.7	92.7	12.34
	1980	13.32	47.8	95.3	12.69
	1973	9.65	41.1	77.8	7.51
Czechoslovakia	1982	16.60	22.9	98.5	16.35
	1981	18.50	26.8	98.2	18.17
	1980	19.26	27.1	97.6	18.80
	1973	14.18	22.8	92.0	13.05
GDR	1982	21.20	18.8	81.0	17.10
	1981	22.75	26.1	83.7	19.04
	1980	21.88	22.8	86.9	19.01
	1973	16.05	20.9	81.2	13.03
Hungary	1982	8.78	23.3	79.5	6.98
	1981	7.75	27.0	94.0	7.28
	1980	8.34	35.5	89.9	7.50
	1973	6.55	27.6	87.9	5.76
Poland	1982	13.22	10.7	98.0	12.95
	1981	13.50	11.9	97.0	13.10
	1980	16.35	16.3	80.1	13.10
	1973	11.14	12.0	94.9	10.57
Romania	1982	10.92	0.2	2.0	0.22
	1981	12.90	18.2	20.6	2.66
	1980	15.96	23.3	9.4	1.50
	1973	4.14	8.0	—	—
CMEA-6	1982	83.44	15.6	77.6	64.71
	1981	89.20	22.2	81.8	72.59
	1980	95.11	24.6	76.3	72.60
	1973	61.71	18.6	80.9	49.92

Sources: CIA, Directorate of Intelligence, *Handbook of Economic Statistics 1982: A Reference Aid*, CPAS 82-10006 (Washington, D.C., 1982); George W. Hoffman, "Eastern Europe's Resource Crisis, With Special Emphasis on Energy Resources: Dependence and Policy Options," Policy Study no. 14 (Austin, Tex.: Center for Energy Studies, 1981), p. 25; John L. Scherer, ed., *USSR Facts and Figures Annual*, vol. 6 (Gulf Breeze, Fla.: Academic International Press, 1982), p. 265; Wharton Econometric Forecasting Associates, *Centrally Planned Economies Current Analysis*, vol. 3 (June 1983), nos. 40–42.

growth rate of 4.8 percent from 1971 to 1975, 1 percent in 1979, and a slight absolute decline afterwards.[17] This declining rate was due not only to the rising import prices and tightening of supplies, but also to increasing costs in the production of fuels and energy, mainly caused by less favorable extraction conditions. Among the reasons for these conditions are the depletion of easily accessible deposits, increasing working depths in mines, environmental constraints, and the increasing distance between the new deposits and the main consuming areas. The capital requirements in the energy sector have been increasing in all

CMEA countries, averaging in most cases more than 30 percent of total industrial investment expenditures. Unfortunately the slowdown in energy production was not always accompanied by the necessary reduction in energy consumption growth (about 3.3 percent average annual consumption growth against 1.4 percent production growth in the same period). The gap in Eastern Europe between primary energy production and consumption was estimated at 99 mtoe in 1982 (see appendix B), and was predominantly covered by energy imports from the Soviet Union. The Soviet Union supplied the six CMEA countries with over 80 percent of their oil and oil products and 99 percent of their natural gas needs. According to various statements by Eastern European leaders, the availability of fuels and energy has become one of the crucial problems of their economic development.

The impact of this rapidly increasing dependency on Soviet hydrocarbons is analyzed in the following pages, but two factors stand out in the developments since the late 1960s. First, Eastern Europe's industrial modernization, however slowly it is progressing, has greatly increased its energy materials dependency on the Soviet Union. Second, the Eastern European CMEA countries have steadily shifted from being an economic asset to being an economic burden to the Soviet Union. It is a burden that the Soviet Union for political reasons can hardly shed.[18]

The energy crisis of 1973–74 was followed by sharp price increases in Soviet fuel and raw materials, but they were still below world market prices, and recent increasing constraints in the delivery of oil and petroleum products to the CMEA countries raise serious questions about the economic viability and future growth potential of these countries. Romania, with its own production of hydrocarbons, was less affected by these developments, at least until the latter part of the 1970s.

Additional danger signals that appeared during this decade are related to low efficiency in the production and utilization of power (due to antiquated plants and equipment) as well as to the systemic rigidities of the central planning apparatus. (These problems apply to a lesser extent to Hungary, which underwent a moderately successful economic reform during the 1970s.) The rapid increase of energy consumption in the region following the oil crises also raised serious problems. In sharp contrast to countries of the OECD, energy use accelerated; mean annual per capita rates of growth were faster during the 1974–78 period than during 1965–73 in four of the six states and also in the region as a whole. In addition, despite its still relatively modest contribution to aggregate energy supply (some 15 percent in 1970 and 24 percent at the end of the decade), petroleum accounted for the lion's share of the increment, with over three-fifths of all growth during the 1970s.[19] Concomitant with the attempt to screen out the impact of rising world prices by the Eastern European regimes was their continued commitment to fairly rapid economic growth and expanding investment, albeit at somewhat reduced rates. Much of the new investment was connected with energy, to expand domestic supplies, to facilitate importation from the Soviet Union, and to step up their nuclear program.

The Eastern European countries were aided by a Western credit policy which permitted them a yearly deficit of hard currency trade exceeding $5 billion through the second half of the 1970s and a net currency debt of over $7.4 billion during 1981.[20]

It also became clear that the enormous hard currency debts of the Eastern European countries could only be repaid by the proceeds from hard currency exports. The difficulties of obtaining sufficient hard currencies to repay this debt by exporting high-quality manufactured goods that appeal to the Western industrialized countries is in part due to the economic slowdown in the Western countries and is apt to have a serious impact on the economies of every Eastern European country during the 1980s, i.e., affecting the standard of living of the population and ultimately the political stability of individual Eastern European countries. Without a significant improvement in trade with the West, it will certainly be more difficult for Eastern Europe to obtain additional oil and other essential imports, such as technology and food products.[21]

Ever since the late 1960s the Soviet Union has pressed the Eastern European countries to give added attention to the development of their own energy resources and to increase cooperation within the framework of the comprehensive CMEA program. Demand still outpaced production, especially that of oil, with the East European countries continuing to transform their industrial and power production with increased use of hydrocarbons. As a result of these changes in their energy mix, the inevitable question arose: Could a dependable supply, especially of oil, be obtained in the future from the Soviet Union, and under what conditions? The increased prices that the Eastern European countries were forced to pay to the Soviet Union after 1975 and the emphasis on greater coordination and integration, including the joint development schemes of the Soviet bloc countries, were some of the demands made by the Soviet Union. It became obvious that the Eastern European countries were living "beyond their means." The realization forced them to formulate new energy policies that would take into account the constraints in the Soviet supply as well as their own precarious fuel and raw materials situation. The oil crisis of 1973–74 and the decision by the Soviet Union to raise the price of its fuel and raw materials accelerated the need for long-term policies by the CMEA countries.

Economic Policy and Energy Strategy in the 1970s

The energy shocks since 1973 have affected Western and Eastern Europe in different ways, although a number of common developments are clearly discernible. Europe's massive replacement of coal by oil, though at a much slower pace in the East than the West, increased each subregion's dependence on energy supplies that had to be imported. Eastern Europe became more dependent on Soviet Russia's oil and natural gas resources. Most of Western Europe's oil had to be imported from an unstable Middle East; an increasing amount came from

the Soviet Union. With growing imports of natural gas from the Soviet Union and North Africa, Western Europe became increasingly vulnerable to supply instability.

The countries of Eastern Europe did not experience such a radical energy source transformation as those of the West. The Soviet Union's willingness to supply its Eastern European allies with much-needed oil was influenced by an awareness of Eastern Europe's economic weakness which could easily lead to major economic and political instability. The energy price shocks of the 1970s which had such an important impact on the Western European countries only gradually influenced the Eastern European countries. The Bucharest formula mentioned earlier provided a cushion for five CMEA countries (Romania until the late 1970s was not dependent on Soviet oil deliveries).

Western Europe

The more powerful industrialized countries of Western Europe were in the long run better able to adapt to these shocks than the weaker Eastern European countries. Dramatic energy savings through conservation, structural changes, and diversification of supplies have reduced their oil imports, although it is probably correct to say that the major reason for this decline is the economic slowdown that started in the late 1970s and only secondarily a changing structure in the use of primary energy sources. Energy consumption in Western Europe in 1982 was below the 1974 level with oil imports falling sharply (see appendix B). Consumption in 1982 was only three-quarters of that in 1974 (appendix E). These changes resulted in an increased dependence on imported coal, from 15 percent of coal consumption in 1974 to 16 percent in 1982, and on natural gas, from zero to 10 percent in the same period. In addition, attention to nuclear energy in some countries played a slowly increasing role in Western Europe's electric energy generation. Between 1973 and 1982 France increased its total nuclear generation from 8.0 to 51.3 percent, Belgium from 0.2 to 32.4 percent, West Germany from 4 to 19 percent, and Britain from 9.3 to 18.3 percent (tables 1.3 and 1.4).

With every Western European country following its own national interests and the power of the supranational European Community in Brussels still minimal, the oil crisis between October 1973 and February 1974 found the Western European countries totally unprepared to take joint action to defend their interests against the economic pressures of decreasing petroleum production and rising crude oil prices. While it became clear at an early stage that the prime target of the Arab countries was the United States, Europe and Japan were the most vulnerable to both the embargo and the rising prices for petroleum. Production limitations set by the Arab countries in 1973–74 indicated probable reduction of as much as 12 percent of the energy supply of Western Europe. As a result of these actions, it became uppermost in the minds of all oil-importing countries that they should reduce their oil import dependence on Arab countries, which had challenged their independence, and develop alternative, more secure

Table 1.3. Electrical energy generation by type of fuel, as percent of total generation, 1982/1973

Country	Coal[a]	Oil	Natural gas	Nuclear	Hydro/-geothermal and other[b]
Belgium	37.7 / 22.0	24.2 / 52.0	4.8 / 23.6	32.4 / 0.2	0.9 / 2.2
Denmark	91.5 / 35.7	8.5 / 64.2	— / —	— / —	— / 0.1
FRG	64.3 / 63.0	5.6 / 14.5	9.1 / 12.1	18.9 / 4.0	2.1 / 6.4
France	26.1 / 19.3	10.0 / 39.5	1.7 / 5.5	51.3 / 8.0	10.9 / 27.7
Greece	62.3 / 34.7	31.7 / 49.0	— / —	— / —	6.0 / 16.3
Ireland	23.0 / 24.4	25.2 / 66.4	47.5 / —	— / —	4.3 / 9.2
Italy	16.4 / 3.8	59.2 / 60.5	7.1 / 3.1	5.4 / 2.2	11.9 / 30.4
Luxembourg	58.6[c]/ 36.6[c]	13.9 / 17.5	0.4 / 6.5	— / —	27.1 / 39.4
Netherlands	25.6 / 6.0	21.3 / 12.7	45.5 / 79.3	7.6 / 2.0	— / —
United Kingdom	68.5 / 63.0	11.7 / 24.7	0.7 / 1.4	18.3 / 9.3	0.8 / 1.6
EUR-10	48.8 / 40.8	16.8 / 31.7	6.9 / 10.2	22.8 / 5.4	4.7 / 11.9
Austria	11.6 / 10.5	10.3 / 12.4	8.8 / 11.9	— / —	69.3 / 65.2
Finland	15.6 / 29.4	2.6 / 24.7	1.2 / 1.1	45.3 / —	35.3 / 44.8
Norway	0.1 / —	0.1 / —	— / —	— / —	99.8 /100.0
Portugal	4.0 / 5.7	52.0 / 20.2	— / 1.3	— / —	44.0 / 72.8
Spain	44.8 / 21.0	23.6 / 28.4	3.0 / 0.9	6.9 / 9.1	21.7 / 40.6
Sweden	2.5 / 1.1	6.8 / 24.6	— / 0.2	37.6 / 2.5	53.1 / 71.7
Switzerland	0.8 / —	0.8 / 3.7	0.2 / —	28.3 / 17.2	70.0 / 79.1
OECD (Western Europe)[d]	41.8 / 35.9	13.9 / 27.4	5.4 / 8.5	17.6 / 5.3	21.9 / 22.9
Bulgaria[e]	41.2 / 76.9	30.6 / 14.5	9.4 / —	12.3 / —	6.5 / 8.6
Czechoslovakia	72.9 / 84.3	13.8 / 10.2	7.2 / 3.5	3.1 / 0.2	3.0 / 1.8
GDR	88.7 / 89.8	1.1 / 7.5	3.1 / 2.0	6.9 / 0.3	0.2 / 0.4
Hungary	47.5 / 64.7	14.5 / 18.1	37.5 / 16.6	— / —	0.5 / 0.6
Poland	96.3 / 94.7	3.1 / 4.8	— / —	— / —	0.6 / 0.5
Romania	37.8 / 26.7	13.7 / 10.1	38.9 / 54.6	— / —	9.6 / 8.6
CMEA-6	74.3 / 72.9	8.9 / 15.2	10.9 / 9.5	3.0 / 0.1	2.9 / 2.3
Yugoslavia	55.8 / 47.3	6.6 / 7.0	— / —	— / —	37.6 / 45.7
U.S.S.R.	34.4 / 43.2	24.7 / 23.5	30.4 / 24.4	2.6 / 0.9	7.9 / 8.0

a. Includes hard coal and lignite, as well as derived gases from blast furnaces and coke ovens.
b. Includes energy absorbed for pumping, and purchased steam, wood, peat, industrial residues, etc.
c. Derived gases account for 50.3 percent/36.0 percent respectively.
d. Economic Commission for Europe: Western European Region.
e. Data shown for balance of table are from 1980/1973.
Sources: Eurostat, *Electrical Energy Monthly Bulletin*, vol. 14, no. 3 (1983), 13-16; *Energy Statistics Yearbook 1981* (Luxembourg, 1983), 166-68; United Nations, ECE, *Data Bank* (Geneva, November 1982); OECD/IEA, *Energy Balances of OECD Countries 1971/1981* (Paris, 1983); and OECD/IEA, *Energy Balances of OECD Countries 1970/1982* (Paris, 1984).

energy sources, diversify their supply sources, and reduce the growth of energy consumption by structural shifts and massive conservation measures. European Community partners subscribed to these objectives in principle (common energy policy objectives were set in 1974 and 1980),[22] and every Western European country wanted to avoid being dependent upon imported oil. Yet individual countries often emphasized quite dissimilar priorities. Each country retained

Table 1.4. Nuclear energy production, 1973-82, with capacity projections (terrawatt/ hours) for 1980 and 1990

	1973	1980	1982	Percent of total electricity generation, 1982	Installed capacity (gigawatts) 1982	1990[a]
Belgium	—	12.49	15.62	32.4	2.6	5.5
FRG	12.56	43.68	53.35	18.9	9.8	25.0
France	11.22	61.24	108.88	51.3	20.1	56.0
Italy	3.14	2.21	6.80	5.4	1.3	5.4
Netherlands	1.04	4.20	3.90	7.6	0.5	0.5
United Kingdom	28.00	37.19	44.14	18.3	8.0	12.3
EUR-10	55.96	161.01	232.69	22.8	42.3	105.3[a]
Finland	—	6.98	16.50	45.3	2.2	2.2
Spain	6.55	5.19	8.77	6.9	2.0	12.7
Sweden	2.11	26.73	37.78	37.6	6.5	9.4
Switzerland	6.19	14.35	14.99	28.3	1.9	2.9
OECD (Western Europe)	70.81	214.26	310.73	17.6	54.9	132.5
Bulgaria	—	6.00	—	12.3	1.8	2.1
Czechoslovakia	0.23	4.50	—	3.1	0.9	6.2
GDR	0.35	11.00	—	6.9	1.8	5.5
Hungary	—	—	—	—	0.4	2.1
CMEA-6	0.58	21.50	—	3.0	4.8	15.9

a. Estimated projections from individual countries.
Sources: United Nations, *1980 Yearbook of World Energy Statistics* (New York, 1981); *World Energy Supplies 1973-1978* (New York, 1979); *Data Bank* (Geneva, 1982); OECD, *Nuclear Energy Prospects* (Paris, 1982), 23; CIA, Directorate of Intelligence, *International Energy Statistical Review*, DIIESR 83-002 (Washington, D.C., 22 February 1983); OECD/IEA, *World Energy Outlook* (Paris, 1982), 199; and OECD/IEA, *Energy Balances of OECD Countries 1970/1982* (Paris, 1984).

national control over its supplies and basic policies, e.g., Britain's access to the North Sea resources, West Germany's coal subsidy policies, the aggressive nuclear expansion of France, Italy's determination to retain the right to import cheap coal from Eastern Europe, and the Netherlands' veto of any practical expression of the Community's commitment to the expansion of nuclear power.

The problem of establishing a reliable energy supply base, thus decreasing their dependence on fragile Arab oil imports, received top priority, but at first unfortunately only for a short period. The years between 1975 and 1978 were largely characterized by a return to normalcy. Basically, the major primary energy determinants, according to a study by the Vienna Institute for Comparative Economic Studies, were unlikely to change. These energy determinants were considered "demographic change, growth and structural change in economic development, urbanisation, motorization, relative energy prices, specific energy consumption, demand elasticity of energy supplies, governmental price and regulatory policies,"[23] spatial industrial location policies, etc. While somewhat more emphasis during the period 1974–80 was given to increasing indigenous supplies

such as oil, natural gas, and again coal, it is clear that Western Europe, as a whole, simply cannot become self-sufficient in its energy needs in the future, though some are more optimistic.[24] A major contribution toward reducing its import dependence should come from further diversification of supplies, and here both coal and nuclear power must play a vital role. Europeans have access to advanced nuclear technology but must import a substantial part of their natural uranium needs. Expansion with regard to the enrichment of uranium has taken place and the European Community has several isotope separation installations.[25] Highly enriched uranium is imported from the United States. A recent study by the United Nations therefore concludes that "the region is inextricably linked to the developments in the world energy economy. Both supply and demand considerations of the countries outside of the region will therefore be of vital importance to the development of energy policies and strategies in the region."[26]

The period after 1973–74 saw slow but important changes in the structure and diversification of energy supplies. The opening up of the North Sea to oil and especially to natural gas production played an important role in increasing Western Europe's indigenous energy supplies. Conservation helped to reduce energy demands, especially after the huge price increases of 1979, though it must be stressed that the economic slowdown following the price increases of 1979 was an important factor.

As a result of the energy situation during the 1970s, Western European countries undertook an examination of their energy programs, policies, and prospects. The European Community first recommended to its members in 1974 certain common energy objectives encouraging energy savings by 1985. New targets were set in May 1980 for 1990, but thus far progress has been very slow. The European Economic Commission (ECE) of the United Nations and the IEA in Paris also have established a set of targets for all member states, but detailed coordination and cooperation is slow and often nonexistent.

Securing dependable energy supplies in terms of obtaining both a more advantageous spatial distribution of needed supplies and long-term financing based on the uncertainties of demand is not an easy task. Savings from one source, e.g., crude oil, in spite of the important results achieved since 1973, often means some increase in the demand for another energy source, e.g., natural gas, coal, and/or nuclear power, or often from all three sources. One development, though, cannot be stressed sufficiently. While all the Western European countries became increasingly aware of the vulnerability of some of their energy supplies, especially oil and to a certain extent natural gas, some have maximized their supply alternatives.

Eastern Europe

The energy shocks of the 1970s were experienced in Eastern Europe with a time lag due largely to two important developments. First, the energy mix in 1973 still consisted for the most part of coal and most countries were close to self-sufficiency. Imports that year, largely in the form of oil, accounted for only

some 12 percent of CMEA-6 aggregate energy supply.[27] Second, most of the imports were met by the Soviet Union, since non-Soviet petroleum imports were almost entirely compensated for by exports of refined products in volume and value terms[28] (see table 1.2). Price increases imposed on these countries by the Soviet Union, beginning in 1975, were cushioned by the Bucharest formula which softened the impact caused by the new price increases for the time being. Bohm mentions that the closest Eastern Europe approached world price levels for Soviet oil was in 1978 when Soviet prices were 90–91 percent of bench mark "Arabian crude." Other reports state that the share was two-thirds of world market prices by 1982 or that it may have reached that level by 1983. According to one of these reports it "could well exceed that level after further adjustment due on 1st January 1984."[29]

During most of the 1970s the Eastern European leadership tried to shield their domestic economies from the impact of new world prices. In Hungary, for example, the price of gasoline rose by only 15 percent from 1975 through 1978. Prices of fuel oil, heating oil, and natural gas rose from 21 to 29 percent, and the price of electricity by only 18 percent. Price increases since 1978 ranged between 20 and 65 percent. The rapid price increases in Hungary (other CMEA countries show slower increases) also implied some recentralization and a retrenchment from the significant economic reforms on which Hungary alone among CMEA states had embarked. Where world prices affected enterprises through imports of semi-finished goods and capital goods, heavy subsidies cushioned the impact. These policies were presumably also responsible for rapid increases in energy consumption following the 1973–74 oil crisis. Energy-GDP elasticities (the change in energy demand per increase in unit value of GDP) also rose sharply.[30]

Finally, technological factors also played an important role in the acceleration of gross energy use and, still more, of petroleum demand during this period: "A major element of East European economic policy in the 1970s had been a commitment to the purchase of Western technology. This technology, however, was designed to conform to patterns of energy consumption prevailing in the West. It was largely designed to consume liquid fuels," in a way that reflected their relative cheapness.[31]

It also must be understood that the fuel energy complex has always occupied special importance in economic policy, since it became a critical bottleneck several times well before the price explosion.[32] In the second half of the 1970s, Bulgaria spent over 22 percent of its industrial investment directly on energy; Poland, Romania, and Czechoslovakia 24–26 percent; Hungary 30 percent; and the GDR, apparently, at least as much.[33] Almost half of the 7.3 billion rubles (ca. $10 billion), the original outlay in joint resource projects in the territory of the U.S.S.R., was provided by East European states. This represented from 2 to 4 percent of the aggregate investment in the national economies of these countries and therefore 9 to 13 percent of their industrial investment.[34] A full 30 percent of outlays in the heavy machine building industry of Czechoslovakia was related to the CMEA nuclear program, with the other countries making

smaller contributions.[35] Because of weaknesses in Eastern European technology, substantial portions of these investments, particularly those on Soviet territory, had to rely on Western components and equipment imported largely on credit.

As a result of these trends, the hard currency trade deficit of Eastern Europe soared except in Bulgaria and Czechoslovakia, the countries least open to trade away from the ruble area. During the period from 1976 to 1979 the trade deficit in hard currency reached record heights in each of the other four states.[36] At the same time (while still representing only a fraction of hard currency deficit) the negative trade balance with the U.S.S.R. also multiplied, though with a wide annual oscillation which was partly influenced by the delayed adjustment to world energy prices through the Bucharest formula.[37]

The soaring trade deficits brought home to these regimes the futility of an attempt to insulate the bloc, a lesson reinforced dramatically by the second oil shock, in 1979–80. The worsening terms of trade were wreaking havoc with these economies; directly or indirectly, these problems could be traced to escalating energy prices. Nowhere is this better demonstrated than in Hungary, where changes in relative export and import prices during the 1970s resulted in a loss of national income of almost 9 percent—a greater economic loss, in the words of the Deputy Premier, than that which had been inflicted on the country by World War II. According to econometric studies, three-fifths of that damage was caused, directly or indirectly, by the change in energy prices.[38] With the exception of Poland, the other states of the region experienced less severe but still very significant deterioration of their trade. The response to these shocks in all of these countries has been the adoption of a balance-of-payment-oriented economic policy at the turn of the 1970–80 decade, a policy to which efforts to expand energy supplies, even economic growth itself, must be subordinated.

Eastern Europe and the Soviet Union. The aim of the European CMEA countries during the last Five-Year Plan was to insure sufficient and dependable Soviet supplies of fuel and raw materials on an exchange basis, and if possible to increase them while still leaving a wide margin to satisfy both domestic and hard currency needs. With increasing world prices for fuels and, to a lesser extent, most other raw materials in the 1970s, as well as a slowdown in trade with the West in the late 1970s, Eastern Europe's inability to finance this trade deficit with the West could only add to a dependency on Soviet resources.

In return for supplying its Eastern European allies with hydrocarbons and certain raw materials, the Soviet Union during the 1970s gave a clear indication of what it expected from its East European partners. Increased emphasis on integrationist policies in the form of closer intrabloc cooperation and coordination of long-range plans for key sectors of the economy was to receive top priority following CMEA's major institutional reorganization, the so-called Comprehensive Program of 1971. This program, which aimed to increase economic cooperation among its partners through multilateral arrangements, was contrary to the past emphasis on bilateral arrangements and thus indicated an important shift in

the conduct of intrabloc relations.[39] The program also directed attention to the improvement of the quality of Eastern Europe's exports to the Soviet Union.

The reason for the emphasis on closer cooperation and integration, especially in the field of energy, and its increased urgency since 1975 is related to a decline in the reserves of important fuels and raw materials in the western Soviet Union and to the need to explore new areas, often regions of great climatic and transportation constraints. This decline has been especially pronounced in the energy field, and it was estimated that by 1980 the European part of the Soviet Union supplied only 37 percent of the country's oil, natural gas, and coal. The Urals supplied 7.4 percent, while holding 10 percent of the country's fuel reserves. At the same time, the region east of the Urals supplied 55.6 percent of these vital fuels.[40] Of special significance is the fact that roughly 75 percent of the Soviet population and 82 percent of its industrial location are located in and west of the Urals (measured in gross output of industry and agriculture or in national income). This raises important economic and technological questions. The shift in exploitation, especially of oil and natural gas, to northwestern Siberia and the increasing exploitation of low calorific lignites demands huge capital outlays both in exploration and production and in the development of long-distance ultrahigh voltage transmission to bring electric power to the population centers of European Russia and the Eastern European countries. It is clear, as Hewett has succinctly stated, that "Soviet planners then turn to Eastern Europe with an increasingly clear ultimatum: Eastern Europe must invest in the Soviet primary product shipments."[41] On the other hand, it must be realized that because of the danger of creating "potential economic and consequent political instability by a forced reduction of the standard of living, the U.S.S.R. is thus presumably reluctant to push integration schemes if the resource drain on Eastern Europe, even if subsequently repaid with interest, could intensify economic strains there."[42]

The recent emphasis has been on a series of joint development schemes, many of which were first proposed in the early 1970s. As envisioned by the Soviet Union, these schemes involve major investments in projects located on Soviet territory, many in its western border areas. After completion these projects will benefit both the Soviet Union and the East European countries. The Soiuz gas pipeline (figure 1.2) is thus far the best-known example. Another joint project is the recently completed 750-kilovolt intertie transmission line from Vinnitsa (western Ukraine) to Albertirsa (Hungary), linking the United Power grid (MIR) of the Soviet Union with the electricity grids of Hungary (which received up to 1.5 billion kwh in 1979) and Czechoslovakia (which received up to 350 million kwh in 1979); Bulgaria receives Soviet electricity over a separate transmission line. The MIR grid has a transfer capacity of approximately 2.34 billion kwh/year.

It is hoped that the integration of the Soviet electricity network with that of the Eastern European countries will ultimately reduce the need for shipping fuels for power-generating purposes. Large nuclear power stations (with a capacity of several million kilowatts each) are being built (though much more slowly than

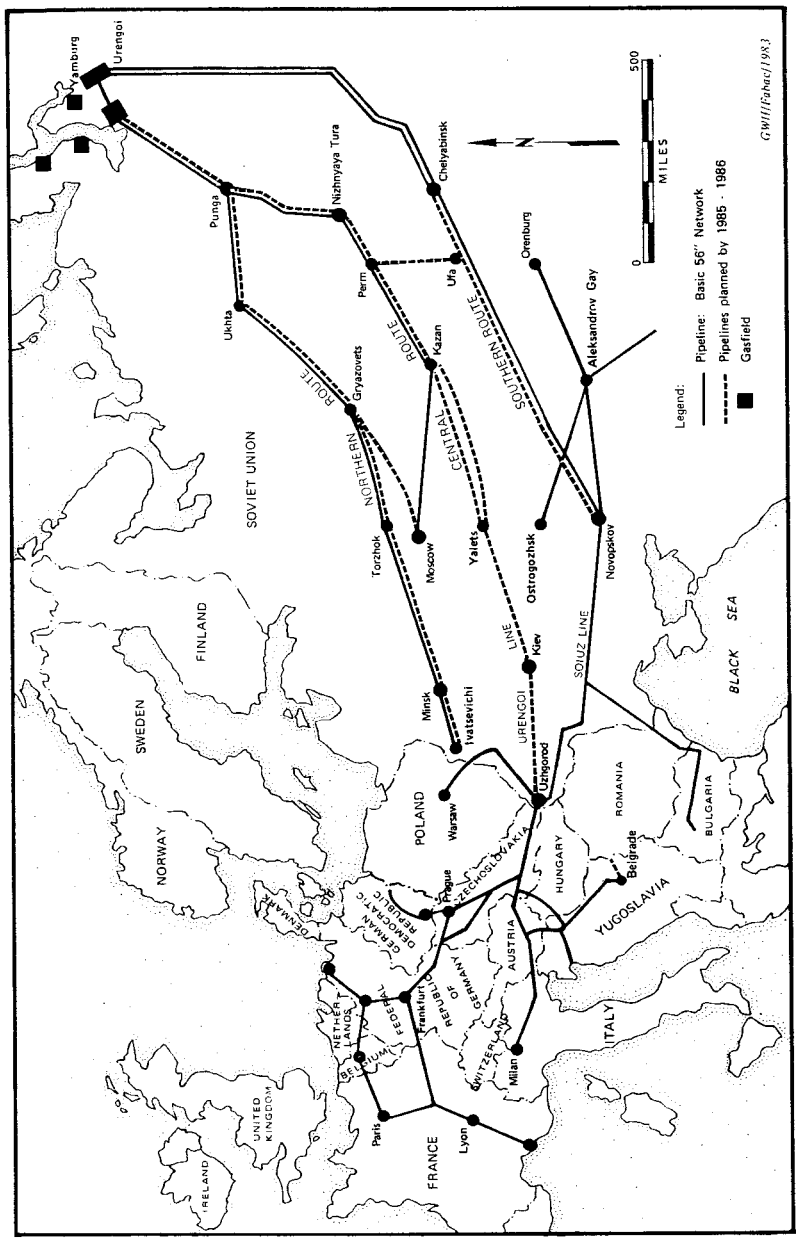

Figure 1.2. Major gas pipeline network from U.S.S.R. to Western Europe

Sources: Based on Edward A. Hewett, "The Pipeline Connection: Issues for the Alliance," *The Brookings Review* (Fall 1982): 16–17; and Craig ZumBrunnen, "The Soviet Union," in *A Geography of Europe: Problems and Prospects*, ed. George W. Hoffmann, 5th ed. (New York: John Wiley, 1983), 551, fig. 11-16.

originally planned) or planned in the Soviet Union's western border areas for transmission of electricity into the common grid. By 1977 Soviet electricity transmission already met 16 percent of Hungary's needs and 14 percent of Bulgaria's,[43] and the Hungarian share further increased to 26 percent in 1983 because of the completion of the 750-kilovolt intertie.

In return for additional resources the Eastern European countries were forewarned by Moscow during the 1970s to expect major changes and sacrifices in terms of closer integration in planning and investment contributions, greater internal efficiency in their economic performance, and eventually world market prices. In addition to the distance involved in bringing these supplies to Eastern European customers, output in most older oil-producing regions in European Russia is declining. West Siberia's production is rising, though very slowly because of production problems in a hostile environment that lacks population and infrastructure. "Severe energy production problems in the form of rising costs of energy development and tighter rationing of domestic energy consumers"[44] are forecast for the mid- to late 1980s, a situation that will certainly have an impact on CMEA's supply problem.

Rising prices for increased Soviet raw material shipments are already having undesirable effects on the economic growth of the Eastern European countries. A further diversion of manufactured goods, especially those of higher quality which are usually sold to the West but which are now demanded by the Soviet Union in exchange for its fuels and certain raw materials, is impeding Eastern Europe's efforts to supply hard currency markets. It is obvious that rising prices of Soviet raw materials "require the transfer of exportables from the West to the Soviet Union at the very time when high debt burdens require the maximization of exports to the West."[45] The whole question of intrabloc trade policies has been raised by several of the CMEA countries, led by Hungary, suggesting a liberalization of these procedures, the development of a system of multilateral settlements, and the introduction of economic exchange rates and currency convertability. This is a question of considerable importance to the more economically advanced of the six European CMEA countries.

Thus the Soviet Union and its Eastern European partners face a real dilemma. Eastern Europe's economic well-being and political stability clearly depend on reliable supplies of imported energy and key raw materials for its expanding industrial production. Soviet supplies are currently filling the gaps. There are some indications of Eastern Europe's reluctance to commit itself to long-term cooperative schemes in view of the numerous potential constraints in Soviet energy production, especially that of oil. This reluctance also points to the importance nearly all Eastern European countries attach to continuing East-West trade. Considering both domestic demands and the importance of Eastern European sales to the Western industrialized countries, Eastern European planners are worried about possible reductions in energy shipments from the Soviet Union, especially of oil, in the quantities needed to sustain current economic growth.

It is clear that the Soviet Union has an important stake in the stability and efficiency of Eastern Europe's economic performance, and the pressure to improve their efficiency might actually induce its Eastern European allies to experiment with their economic systems. Perhaps this strategy could explain such developments as Hungary's economic experimentation during recent years and the obvious approval of Western Europe's loans to the European CMEA countries. The Soviet Union's leverage should be considerable, but because of the threat to Eastern European economic and political stability posed by a reduction in the availability of energy resources, the Soviet Union is in no position to cut oil shipments or raise prices.[46]

Eastern Europe and the West. Two factors contributed to reestablishing trade between Eastern and Western Europe starting in mid-1960: the modernization of Eastern Europe's industries, which required high technology, and the emphasis in Eastern Europe during the 1970s on "consumerism and Western trade." These interests became vital aspects of Eastern Europe's economic relations with the Soviet Union and the Western industrialized countries.

Emphasis on consumerism was intended to promote growth and development within each country. The Western trade component became essential to Eastern Europe's fuel supply, technology, and to some extent food products. A large part of the trade was based on borrowing sizable sums from the more-than-willing Western commercial lenders, mostly private banks and government agencies that were anxious to develop new export markets. Trade between the Eastern and Western European countries also became a channel through which the Soviet Union obtained considerable Western technology. This trade was made possible in part by the availability of huge surplus funds generated by OPEC and deposited in Western banks. The banks in turn sought ways in which to lend these funds profitably. Other factors favoring loans to the Eastern European countries and the Soviet Union were the economic slowdown in the West, which resulted in a capital surplus, and unemployment, which encouraged governments to promote exports to willing purchasers and to arrange government guarantees and sometimes even subsidies.

An important ingredient in the expansion of this trade was that Western European governments' relaxation of their restrictions on loans to Communist countries. Only the United States restricts government loans to the Soviet Union, East Germany, Czechoslovakia, and Bulgaria. Among the Western Europeans, the Federal Republic of Germany dominates the Eastern European markets.

Increased East-West trade presents more problems for the East because the European CMEA countries are tied to long-term commercial treaties with Moscow that cannot easily be rescinded or even adjusted. They must also supply their own scarce labor and equipment, usually purchased in the West with Eastern Europe's hard currency or on credit, for pipelines and other joint ventures for which payment is made in future deliveries of oil, natural gas, and other commodities. On the other hand, increased integration in the bloc countries has an important impact on the structural arrangements of the Western industries and therefore on the composition of employment dependent on the East European trade.[47] Some Eastern European plants built by Western investment are based on agreements whereby Western countries buy back some of the output as partial payment.

Imports from the West consist mainly of energy-related capital goods such as turbines, offshore drilling rigs, large-diameter pipe, and other vital technology. It is quite possible that the increased Eastern European investments in the Soviet Union or increased intrabloc trade will affect the export sector of the economy and thereby create additional balance-of-payment problems and a sizable reduction in East-West trade. Long-range plans to upgrade the quality of manufacturing exports from Eastern to Western Europe will certainly be affected by a slowdown in Western equipment and technology imports. The reluctance of Eastern European countries to become more heavily indebted will also act as a constraint to the expansion of East-West trade.

The Lessons of the 1970s

The developments of the 1970s in both regions of Europe, especially the dramatic price increases in 1973–74 and again in 1979, provided certain basic lessons which are in many ways applicable to both the developed market economies and the centrally planned economies. While the methods of implementation as well as the timing differ, the overriding energy policy for all European countries in the last few years "has been to ensure the smooth transition of their energy systems based on cheap and abundant oil, towards greater energy economy and efficiency, greater reliance on domestic sources and a more pronounced diversification of supplies with emphasis on oil substitution."[48] In the Western European countries adjustments in energy demand, supply, and trade basically consist of two types of needed changes based on the lessons of the 1973–80 experiences: (1) those emphasizing temporary adjustments due to short-term changes in economic activity (they are of less concern in this analysis), and (2) structural adjustments that have a long-term impact.[49] It is these long-term adjustments which affect the energy future of individual countries.

Most of the changes agreed upon by the Western European countries reflect their new perceptions of their economic and geopolitical position: they are based on their concern for their dangerous dependence on imports of essential energy supplies, and in particular, the threat of oil supply disruptions. Imported oil amounted to 61 percent of Western European total primary energy demand during the 1973–74 disruption. The threat of an oil supply disruption, i.e., the impact of political instability in the Middle East, or of the use of increasing political leverage by the Soviet Union, has posed a serious supply-security risk

for every Western European country since the 1970s. Future increases in oil prices and increased prices for natural gas certainly pose the danger of providing leverage for influencing the economies of the Western European countries. While diversification of supplies is essential in reducing the vulnerability of key supplies, diversification in itself can also pose new economic and security risks, as the case of increased Soviet natural gas and oil supplies may show.

The steps outlined below are based on the lessons learned during the 1970s and are to provide security in the case of "deliberate interruptions in supplies, providing, in the case of deliberate disruptions, a certain capability for resistance to economic or political pressures applied by the suppliers."[50] It must be realized, however, that the various measures initiated by the Western European countries do not protect against the usual market and price fluctuations. Further, as Peter Odell, Economic Geography professor at Rotterdam's Erasmus University and long-time critic of the constraints in the development of North Sea and Eastern European hydrocarbon reserves, emphasizes—and he is by no means the only one—"Western European strategy in respect to oil (and of natural gas) production is thus constrained more by politics and institutions, than it is by the likely size of the resource base."[51] The various policies planned or initiated by the European countries by the end of the 1970s are summarized as follows:

1. Structural changes by diversification of supplies, especially oil substitutes, to reduce the vulnerability of key supplies. (Appendix A compares changes in primary consumption of energy.) Such diversification must also give special attention to a greater geographic spread of individual resource supplies.
2. The importance of increasing the development of indigenous resources, especially coal and natural gas but also oil, and, for some countries, hydroelectric power, geothermal energy, and certain new and renewable sources of energy, e.g., solar energy and biomass. The European Community has allocated increasing funds to research and development in the energy sector since 1976.[52] The real growth of IEA government energy research and development budgets since 1977 is shown in table 1.5. The Eastern European countries, in spite of their current policy of cutting down on new investments, are also devoting increasing attention to the development of indigenous resources, especially coal.
3. The oil crisis of 1973 brought nuclear power again to the foreground as a substitute for oil in electric power generation. Since that time, with some slowdown due to political and economic constraints in some countries, nuclear power has become increasingly important in many Western European countries. The conversion of oil-burning and some natural gas-burning plants to coal, and the introduction of more nuclear plants have been assigned top priority by most European countries, both Eastern and Western.
4. Priority has been assigned in all Eastern European countries to stemming energy waste both from the structural pattern of energy flows and from systemic inefficiencies. While such initiatives play an important role in all European countries, they pose a more important and serious problem in the Eastern European countries.
5. A program of fuel and energy savings through conservation and improved management of resource allocations, especially efficiency in energy systems, has been assigned top priority in all European countries. These efforts include the production of petroleum through intensive application of enhanced recovery technology (thermal and chemical), although the cost factor has a greater impact in the developed market economies of Western Europe.
6. The Western European countries realized after the energy crisis of 1973–74 that major energy policy objectives, including changes on a national level, can only be accomplished by increasing inter- and intra-European cooperation and by increasing worldwide linkages. Such cooperation was also extended by increasing East-West trade. Active cooperation in the energy field was started among the Western European countries in 1973 but the implementation of needed policies has been very slow. Such cooperation included activities within the framework of the European Community, the Organization for Economic Co-Operation and Development (OECD) and its Nuclear Energy Agency (founded in 1958 to further the development of nuclear energy for peaceful

Table 1.5. Real growth of IEA government energy research, development, and demonstration budgets (in millions of 1981 U.S. dollars)[a]

Country	1977	1980	1981	1980–81 growth (in percent)	1977–81 growth (in percent)	GDP growth 1977–81 (in percent)
Austria	20.6	23.6	24.8	5	20	9
Belgium[b]	106.0	110.8	97.4	12	8	7
Denmark[b]	19.1	22.6	27.3	21	43	4
Germany[b]	729.9	872.4	968.9	11	33	9
Greece[b]	1.1	37.4	30.3	19	2655	12
Ireland[b]	2.5	6.1	7.1	16	184	13
Italy[b]	208.6	298.7	526.0	76	152	12
Netherlands[b]	122.5	134.9	138.8	3	13	3
Norway	30.1	38.9	33.4	14	11	15
Portugal	—	4.5	5.1	13	—	17
Spain	46.8	77.9	69.3	11	48	6
Sweden	77.9	123.7	140.1	13	104	7
Switzerland	31.5	52.2	49.9	4	58	9
UK[b,c]	424.9	513.0	504.1	2	19	1

Note: Exchange rates used are annual averages from the IMF International Financial Statistics.

a. For the calculation of the values of 1981 prices, GNP/GDP deflators from the OECD Economic Outlook were used.

b. The expenditures of the EC member countries do not include their contributions to the EC programs. The total EC energy RD&D expenditure appears in the bottom line of the table, including France.

c. With respect to nationalized industries, the United Kingdom figures include only the expenditures on energy RD&D financed by government funds. Other expenditures by nationalized industries on energy RD&D were 51.3 million in 1974, rising to 172.7 million in 1981.

Source: Modified from IEA, *Energy Research, Development and Demonstration in the IEA Countries: 1981 Review of National Programmes* (Paris, 1982), 18.

purposes), and the International Energy Agency (IEA), which was created in November 1974 in the wake of the oil crisis to implement an international agreement on an international energy program. Its policy-oriented and operational body operates within the framework of the OECD and is committed to improving the future balance of energy supply and demand. In establishing inter-European and worldwide linkages Western European countries were hoping to reduce the danger and negative economic impact of a disruption of oil supplies and at the same time increase their political leverage against the energy suppliers. Basically, the Western European countries were hoping in the long run to promote economic growth without the energy constraint by making joint efforts "to encourage free market mechanism and prices in order to rationally allocate the energy resources, to reduce oil consumption through conservation and substitution and to make use of other sources (coal, nuclear and renewable)."[53]

The centrally planned economies, too, were cooperating in the field of energy on a multilateral basis, but because they were able to depend for most of their energy supplies on neighboring Soviet Russia, their problem was not a question of security of supplies and obtaining political leverage. Cooperation extended to mutual exploration of natural resources of fossil fuels, joint developments of electricity production and transmission, including the development of nuclear electricity production, investment cooperation in energy production and transmission, cooperation in energy conservation, the rational utilization of fuels and electricity, and cooperation in rational development and location of energy-intensive enterprises.[54] Implementation of these various cooperative plans is through the Long-Run Special-Purpose Program (LRSPP) and is designed to address Eastern Europe's energy needs in the 1980s and 1990s.[55]

Western as well as Eastern Europe was rudely awakened by the huge price increase of oil in 1979. Many of the necessary steps contemplated after the 1973–74 oil shock, including greater energy cooperation in Western Europe and a change in the fuel mix by the Eastern European countries, had been delayed during the period between the two oil price increases. The second oil shock in 1979 made all European countries more aware of relying on indigenous energy supplies, the security aspects of the increasing hydrocarbon imports, the importance of fuel and energy savings, especially efficiency in energy systems, and inter- and intraregional energy cooperation.

The developments of the 1970s have made it clear that the countries of Western and Eastern Europe are unlikely to become self-sufficient in energy in this century and that the energy supply situation of all these states is dependent on the world energy economy which is an integral part of the world economic system. Such a linkage demands greater intra-European and worldwide cooperation among all industrialized countries, but it should be pointed out immediately that complete cooperation still has not been accomplished in either Western or Eastern Europe. In addition, increased energy trade diversification must become more important in the future supply situation in order to avoid continuous dependence on a few countries, thus providing added security for critical energy sources. An accelerated period of energy transition became the challenge for all European countries during the 1980s.